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THE AIMS OF ANTHROPOLOGY.*

A MODERN philosopher has advanced the maxim that what is first in thought is last in expression; illustrating it by the rules of grammar, which are present even in unwritten languages, whose speakers have no idea of syntax or parts of speech.*

It may be that this is the reason why man, who has ever been the most important creature to himself in existence, has never seriously and to the best of his abilities made a study of his own nature, its wants and its weaknesses, and how best he could satisfy the one and amend the other.

The branch of human learning which undertakes to do this is one of the newest of the sciences; in fact, it has scarcely yet gained admission as a science at all, and is rather looked upon as a dilettante occupation, suited to persons of elegant leisure and retired old gentlemen, and without any very direct or visible practical applications of concern with the daily affairs of life.

It is with the intention of correcting this prevalent impression that I address you today. My endeavor will be to point out both the immediate and remote aims of the science of anthropology, and to illustrate by some examples the bearings they have, or surely soon will have, on the thoughts and acts of civilized communities and intelligent individuals.

It is well at the outset to say that I use the term anthropology in the sense in which it has been adopted by this Association, that is, to include the study of the whole

* Address by the retiring President of the American Association for the Advancement of Science, at the Springfield meeting, August 29, 1895.

* Professor James Ferrier, in his *Institutes of Metaphysic.*

of man, his psychical as well as his physical nature, and the products of all his activities, whether in the past or in the present. By some writers, especially on the continent of Europe, the term anthropology is restricted to what we call physical anthropology or somatology, a limitation of the generic term which we cannot but deplore. Others again, and some of worthy note, would exclude from it the realm of history, confining it in time to the research of prehistoric epochs, and in extent to the investigation of savage nations.

I cannot too positively protest against such opinions. Thus 'cabinned, cribbed, confined,' it could never soar to that lofty eminence whence it could survey the whole course of the life of the species, note the development of its inborn tendencies, and mark the lines along which it has been moving since the first syllables of recorded time; for this, and nothing less than this, is the bold ambition toward which aspires this crowning bough of the tree of human knowledge.

You will readily understand from this the magnitude of the material which anthropology includes within its domain. First, it investigates the physical life of man in all its stages and in every direction. While he is still folded in the womb, it watches his embryonic progress through those lower forms, which seem the reminiscences of far-off stages of the evolution of the species, until the child is born unto the world, endowed with the heritage transmitted from innumerable ancestors and already rich in personal experiences from its prenatal life. These combined decide the individual's race and strain, and potently incline, if they do not absolutely coerce, his tastes and ambitions, his fears and hopes, his failure or success.

On the differences thus brought about, and later nourished by the environment, biology, as applied to the human species, is based; and on them, as expressed in aggregates, ethnography, the separation of the species into subspecies and smaller groups, is founded. It has been observed that numerous and persistent, although often slight differences arose in remote times, independently, on each of the great continental areas, sufficient to characterize with accuracy these subspecies. We therefore give to such the terms 'races' or 'varieties' of man.

All these are the physical traits of man. They are studied by the anatomist, the embryologist, the physician; and the closest attention to them is indispensable, if we would attain a correct understanding of the creature man, and his position in the chain of organic life.

But there is another vast field of study wholly apart from this and even more fruitful in revelations. It illustrates man's mental or psychical nature, his passions and instincts, his emotions and thoughts, his powers of ratiocination, volition and expression. These are preserved and displayed subjectively in his governments and religions, his laws and his languages, his words and his writings; and, objectively, in his manufactures and structures, in the environment which he himself creates—in other words, in all that which we call the arts, be they 'hooked to some useful end,' or designed to give pleasure only.

It is not sufficient to study these as we find them in the present. We should learn little by such a procedure. What we are especially seeking is to discover their laws of growth, and this can only be done by tracing these outward expressions of the inward faculties step by step back to their incipiency. This leads us inevitably to that branch of learning which is known as archæology, 'the study of ancient things,' and more and more to that part of archæology called prehistoric, for that concerns itself with the most ancient; and the most

ancient is the simplest, and the simplest is the most transparent, and therefore the most instructive.

Prehistoric archæology is a new science. I can remember when neither its name nor its methods were known to the most learned anthropologists. But it has already taught us by incontrovertible arguments a wonderful truth, a truth opposing and reducing to nought many teachings of the sages and seers of past generations. They imagined that the primal man had fallen from some high estate; that he had forfeited by his own falseness, or been driven by some hard fate, from a pristine Paradise, an Eden garden, an Arcady; that his ancestors were demi-gods and heroes, himself their degenerate descendant.

How has prehistoric archæology reversed this picture? We know beyond cavil or question that the earliest was also the lowest man, the most ignorant, the most brutish, naked, homeless, half-speechless. But the gloom surrounding this distant background of the race is relieved by rays of glory; for with knowledge not less positive are we assured that through all hither time, through seeming retrogressions and darkened epochs, the advance of the race in the main toward a condition better by every standard has been certain and steady, 'ne'er known retiring ebb, but kept due on.'

Archæology, however, is, after all, a dealing with dry bones, a series of inferences from inanimate objects. The color and the warmth of life, it never has. How can we divine the real meaning of the fragments and ruins, the forgotten symbols and the perished gods, it shows us?

The means has been found, and this through a discovery little less than marvelous, the most pregnant of all that anthropology has yet offered, not yet appreciated even by the learned. This discovery is that of the psychical unity of man, the parallelism of his development everywhere and in all time; nay, more, the nigh absolute uniformity of his thoughts and actions, his aims and methods, when in the same degree of development, no matter where he is, or in what epoch living. Scarcely anything but his geographical environment, using that term in its larger sense, seems to modify the monotonous sameness of his creations.

I shall refer more than once to this discovery; for its full recognition is the corner stone of true anthropology. In this connection I refer to it for its application to archæology. It teaches us this: that when we find a living nation of low culture, we are safe in taking its modes of thought and feeling as analogous to those of extinct tribes whose remains show them to have been in about the same stage of culture.

This emphasizes the importance of a prolonged and profound investigation of the few savage tribes who still exist; for although none of them is as rude or as brute-like as primitive man, they stand nearest to his condition, and, moreover, so rapid nowadays is the extension of culture that probably not one of them will remain untouched by its presence another score of years.

Another discovery, also very recent, has enabled us to throw light on the prehistoric or forgotten past. We have found that much of it, thought to be long since dead, is still alive and in our midst, under forms easily enough recognized when our attention is directed to them. This branch of anthropology is known as Folklore. It investigates the stories, the superstitions, the beliefs and customs which prevail among the unlettered, the isolated and the young; for these are nothing less than survivals of the mythologies, the legal usages and the sacred rites of earlier generations. It is surprising to observe how much of the past we have been able to reconstruct from this humble and long neglected material.

From what I have already said, you will understand some of the aims of anthropology, those which I will call its 'immediate' aims. They are embraced in the collection of accurate information about man and men, about the individual and the group, as they exist now, and as they have existed at any and all times in the past; here where we are, and on every continent and island of the globe.

We desire to know about a man, his weight and his measure, the shape of his head, the color of his skin and the curl of his hair; we would pry into all his secrets and his habits, discover his deficiencies and debilities, learn his language, and inquire about his politics and his religion, yes, probe those recesses of his body and his soul which he conceals from wife and brother. This we would do with every man and every woman, and, not content with the doing it, we would register all these facts in tables and columns, so that they should become perpetual records, to which we give the name 'vital statistics.'

The generations of the past escape such personal investigation, but not our pursuit. We rifle their graves, measure their skulls, and analyze their bones; we carry to our museums the utensils and weapons, the gods and jewels, which sad and loving hands laid beside them; we dig up the foundations of their houses and cart off the monuments which their proud kings set up. Nothing is sacred to us; and yet nothing to us is vile or worthless. The broken potsherd, the half-gnawed bone, cast on the refuse heap, conveys a message to us more pregnant with meaning, more indicative of what the people were, than the boastful inscription which their king caused to be engraved on royal marble.

This gleaning and gathering, this collecting and storing of facts about man from all quarters of the world and all epochs of his existence, is the first and indispensable aim of anthropologic science. It is pressing and urgent beyond all other aims at this period of its existence as a science; for here more than elsewhere we feel the force of the Hippocratic warning, that the time is short and the opportunity fleeting. Every day there perish priceless relics of the past, every year the languages, the habits and the modes of thought of the surviving tribes which represent the earlier condition of the whole species, are increasingly transformed and lost through the extension of civilization. It devolves on the scholars of this generation to be up and doing in these fields of research; for those of the next will find many a chance lost forever, of which we can avail ourselves.

And here let me insert a few much needed words of counsel on this portion of my theme. Why is it that even in scientific circles so little attention is paid to the proper training of observers and collectors in anthropology?

We erect stately museums, we purchase costly specimens, we send out expensive expeditions; but where are the universities, the institutions of higher education, that train young men how to observe, how to explore and collect in this branch? As an eminent ethnologist has remarked, in any other department of science, in that, for instance, which deals with flowers or with butterflies, no institution would dream of sending a collector into the field who lacked all preliminary training in the line, or knowledge of it; but in anthropology the opinion seems universal that such preparation is quite needless.* Carlyle used to say that every man feels himself competent to be a gentleman farmer or a crown prince;

*See the pertinent remarks of Dr. S. R. Steinmetz in the Einleitung to his *Ethnologische Studien zur Ersten Entwicklung der Strafe* (Leiden, 1894). I have urged this point further in a pamphlet entitled *Anthropology; as a Science and as a branch of University Education in the United States* (Philadelphia, 1892).

our institutions seem to think that every man is competent to be an anthropologist and archæologist; and let a plausible explorer present himself, the last question put to him will be, whether he has any fitness for the job.

Hence our museums are crammed with doubtful specimens, vaguely located, and our volumes of travel with incomplete or wholly incorrect statements, worse than purely fictitious ones, because we know them to be the fruit of honest intentions, and therefore give them credit.

But, you will naturally ask, to what end this accumulating and collecting, this filling of museums with the art-products of savages and the ghastly contents of charnel houses? Why write down their stupid stories and make notes of their obscene rites? When it shall be done, or as good as done, what use can be made of them beyond satisfying a profitless curiosity?

This leads me to explain another branch of anthropology to which I have not yet alluded, one which introduces us to other aims of this science, quite distinct from those I have mentioned. That branch is Ethnology.

Ethnology in its true sense represents the application of the principles of inductive philosophy to the products of man's faculties. You are aware that that philosophy proceeds from observed facts alone; it discards all proconceived opinions concerning these facts; it renounces all allegiance to dogma, or doctrine or intuition; in short, to every form of statement that is not capable of verification. Its method of procedure is by comparison, that is, by the logical equations of similarity and diversity, of identity and difference; and on these it bases those generalizations which range the isolated fact under the general law, of which it is at once the exponent and the proof.

By such comparisons, ethnology aims to define in clear terms the influence which the geographical and other environment exercises on the individual, the social group and the race; and, conversely, how much in each remains unaltered by the external forces, and what residual elements are left, defiant of surroundings, wholly personal, purely human. Thus, rising to wider and wider circles of observation and generalization, it will be able at last to offer a conclusive and exhaustive connotation of what man is—a necessary preliminary, mark you, to that other question, so often and so ignorantly answered in the past, as to what he should be.

Ethnology, however, does not and should not concern itself with this latter inquiry. Its own field is broad enough, and the harvest offered is rich enough. Its materials are drawn from the whole of history and from pre-history. Those writers who limit its scope to the explanation of the phenomena of primitive social life only have so done because these phenomena are simpler in such conditions, not that the methods of ethnology are applicable only to such. On the contrary, they are not merely suitable, they are necessary to all the facts of history, if we would learn their true meaning and import. The time will come, and that soon, when sound historians will adopt as their guide the principles and methods of ethnologic science, because by these alone can they assign to the isolated fact its right place in the vast structure of human development.

In the past, histories have told of little but of kings and their wars; some writers of recent date have remembered there is such a thing as the People, and have essayed to present its humble annals; but how few have even attempted to avail themselves of the myriad side-lights which ethnology can throw on the motives and the manners of a people, its impulses and acquisitions?

It is the constant aim of ethnology to

present its results free from bias. It deprecates alike enthusiasm and antipathy. Like Spinoza's God, *nullum amat, nullum odit.* Its aim is to compare dispassionately all the acts and arts of man, his philosophies and religions, his social schemes and personal plans, weighing and analyzing them, separating the local and temporal in them from the permanent and general, explaining the former by the conditions of time and place, referring the latter to the category of qualities which make up the oneness of humanity, the solid ground on which he who hereafter builds, 'will build for aye.'

This, then, briefly stated, is the aim of that department of anthropology which we call ethnology. In yet fewer words, its mission is 'to define the universal in humanity,' as distingnished from all those traits which are the products of fluctuating environments.

This universal, however, is to be discovered, not assumed. The fatal flaw in the arguments of most philosophers is that they frame a theory of what man is and what are the laws of his growth, and pile up proofs of these, neglecting the counter-evidence, and passing in silence what contradicts their hypotheses.

Take, for instance, the doctrine of evolution as applied to man. It is not only a doctrine but a dogma with many scientists. They look with theological ire on any one who questions it. I have already said that in the long run and the general average it has been true of man. But that we have any certainty that it will continue true is a mistake; or that it has been true of the vast majority of individuals or ethnic groups is another mistake. As the basis for a boastful and confident optimism it is as shaky as sand. Taken at its real value, as the provisional and partial result of our observations, it is a useful guide; but swallowed with unquestioning faith, as a final law of the universe, it is not a whit more inspiring than the narrowest dogma of religious bigotry.

We have no right, indeed, to assume that there is anything universal in humanity until we have proved it. But this has been done. Its demonstration is the last and greatest conquest of ethnology, and it is so complete as to be bewildering. It has been brought about by the careful study of what are called 'ethnographic parallels,' that is, similarities or identities of laws, games, customs, myths, arts, etc., in primitive tribes located far asunder on the earth's surface. Able students, such as Bastian, Andree, Post, Steinmetz and others have collected so many of these parallels, often of seemingly the most artificial and capricious character, extending into such minute and apparently accidental details, from tribes almost antipodal to each other on the globe, that Dr. Post does not hesitate to say: "Such results leave no room for doubt that the psychical faculties of the individual as soon as they reach outward expression fall under the control of natural laws as fixed as those of inorganic nature."*

As the endless variety of arts and events in the culture history of different tribes in different places, or of the same tribe at different epochs, illustrates the variables in anthropologic science, so these independent parallelisms prove beyond cavil the ever-present constant in the problem, to wit, the one and unvarying psychical nature of man, guided by the same reason, swept by the same storms of passion and emotion, directed by the same will towards the same goals, availing itself of the same means when they are within reach, finding its pleasures in the same actions, lulling its fears with the same sedatives.

The anthropologist of to-day who, like a late distinguished scholar among ourselves,

* Dr. A. H. Post, 'Ethnologische Gedanken,' in *Globus*, Band 59, No. 19.

would claim that, because the rather complex social system of the Iroquois had a close parallel among the Munda tribes of the Punjab, therefore the ancestors of each must have come from a common culture center; or, who, like an eminent living English ethnologist, sees a proof of Asiatic relations in American culture because the Aztec game of *patolli* is like the East Indian game of *parchesi*—such an ethnologist, I say, may have contributed ably to his science in the past, but he does not know where it stands to-day. Its true position on this crucial question is thus tersely and admirably stated by Dr. Steinmetz: "The various customs, institutions, thoughts, etc., of different peoples are to be regarded either as the expressions of the different stadia of culture of our common humanity; or, as different reactions of that common humanity under varying conditions and circumstances. The one does not exclude the other. Therefore the concordance of two peoples in a custom, etc., should be explained by borrowing or by derivation from a common source only when there are special, known and controlling reasons indicating this; and when these are absent, the explanation should be either because the two peoples are on the same plane of culture, or because their surroundings are similar."*

This is true not only of the articles intended for use, to supply the necessities of existence, as weapons and huts and boats —we might anticipate that they would be something similar, otherwise they would not serve the purpose everywhere in view; but the analogies are, if anything, still more close and striking when we come to compare pure products of the fancy, creations of the imagination or the emotions, such as stories, myths and motives of decorative art.

It has proved very difficult for the comparative mythologist or the folk-lorist of the old school to learn that the same stories, for instance, of the four rivers of Paradise, the flood, the ark and the patriarch who is saved in it, arose independently in western Asia, in Mexico and in South America, as well as in many intervening places, alike even in details, and yet neither borrowed one from the other, nor yet drawn from a common source. But until he understands this, he has not caught up with the progress of ethnologic science.

So it is also with the motives of primitive art, be they symbolic or merely decorative. How many volumes have been written tracing the migrations and connections of nations by the distribution of some art motive, say the *svastika*, the meander or the cross! And how little of value is left in all such speculations by the rigid analysis of primitive arts that we see in such works as Dr. Grosse's *Anfänge der Kunst*, or Dr. Haddon's attractive monograph on the 'Decorative Art of British New Guinea,' published last year! The latter sums up in these few and decisive words the result of such researches pursued on strictly inductive lines—"The same processes operate on the art of decoration whatever the subject, wherever the country, whenever the age." This is equally true of the myth and the folk-tale, of the symbol and the legend, of the religious ritual and the musical scale.

I have even attempted, I hope not rashly, to show that there are quite a number of important words in languages nowise related by origin or contact, which are phonetically the same or similar, not of the mimetic class, but arising from certain common relations of the physiological function of language; and I have urged that words of this class should not be accounted of value in studying the affiliations of language.*

* Dr. S. R. Steinmetz, ubi supra, Einleitung.

* 'On the Physiological Correlation of certain Linguistic Radicals.' By D. G. Brinton. In the *Proceedings* of the American Oriental Society, March, 1894.

And I have also endeavored to demonstrate that the sacredness which we observe attached to certain numbers, and the same numbers, in so many mythologies and customs the world over, is neither fortuitous, nor borrowed the one from the other; but depends on fixed relations which the human body bears to its surroundings, and the human mind to the laws of its own activity. And, therefore, that all such coincidences and their consequences—and it is surprising how far-reaching these are—do not belong to the similarities which reveal contact, but only to those which testify to psychical unity.*

So numerous and so amazing have these examples of culture-identities become of late years that they have led more than one student of ethnology into a denial of the freedom of the human will under any of the definitions of voluntary action. But the aims of ethnology are not so aspiring. It is strictly a natural science, dealing with outward things, to wit, the expressions of man's psychical life, endeavoring to ascertain the conditions of their appearance and disappearance, the organic laws of their birth, growth and decay. These laws must undoubtedly be correlated with certain mental traits, but it is not the business of the ethnologist to pursue them to their last analysis in the realm of metaphysics. For instance, we may trace all forms of punishment back to the individual's passion for revenge; or we may analyze all systems of religion until we find the common source of all to be man's dread of the unknown; and these will be sufficient ethnologic explanations of both these phenomena, but not a final analysis of the emotion of dread or the thirst for vengeance. Ethnology declines to enter these realms of abstractions.

I repeat that to define 'the universal in humanity' is the aim of ethnology, that is, the universal soul or *psyche* of humanity.

But let me not be understood as speaking of this as of some entity, like the *ame humaine* of the Comtists. That were sophistical word-mongering in the style of ancient scholasticism. There is no such entity as humanity, or race, or people, or nation. There is nothing but the individual man or woman, the 'single, separate person,' as Walt Whitman says. Hence some of the most advanced ethnologists are ready to give up the *ethnos* itself as a subject of study. Those terms so popular a few years ago, *Völkerpschologie*, *Völkergedanken*, racial psychology, ethnic sentiments, and the like, are looked upon with distrust. The external proofs of the psychical unity of the whole species have multiplied so abundantly that some maintain strenuously that it is not ethnic or racial peculiarities, but solely external conditions on the one hand and individual faculties on other, which are the factors of culture-evolution.

While I admit that this question is still *sub judice*, I add that the position just stated seems to be erroneous. All members of the species have common human mental traits; that goes without saying; and in addition it seems to me that each of the great races, each ethnic group, has its own added special powers and special limitations compared with others; and that these ethnic and racial psychic peculiarities attached to all or nearly all members of the group are tremendously potent in deciding the result of its struggle for existence.

I must still deny that all races are equally endowed—or that the position with reference to civilization which the various ethnic groups hold to-day is one merely of opportunity and externalities. I must still claim that the definition of the *ethnos* is one

*'The Origin of Sacred Numbers.' By D. G. Brinton. In the *American Anthropologist*, April, 1894. In my *Myths of the New World* (New York, 1868, Chapter III, 'The Sacred Number, its Origin and Applications'), I had shown the prepotency of the number *four* both in American and Old World mythology, ritual, statecraft, etc.

of the chief aims of ethnology, and that the terms of this definition are not satisfied by geographic explanations. Let me, with utmost brevity, name a few other connotations, prepotent, I believe, in the future fate of nations and races.

None, I maintain, can escape the mental correlations of its physical structure. The black, the brown and red races differ anatomically so much from the white, especially in their splanchnic organs, that even with equal cerebral capacity, they never could rival its results by equal efforts.

Again, there is in some stocks and some smaller ethnic groups a peculiar mental temperament which has become hereditary and general, of a nature to disqualify them for the atmosphere of modern enlightenment. Dr. Von Buschan has recently pointed out this as distinctly and racially pathologic; an inborn morbid tendency, constitutionally recreant to the codes of civilization, and therefore technically criminal.

Once more, one cannot but acknowledge that the relations of the emotional to the intellectual nature vary considerably and permanently in different ethnic groups. Nothing is more incorrect than the statement so often repeated by physicians that the modern civilized man has a more sensitive emotional system than the savage. The reverse is the case. Since the Dark Ages, Europe has not witnessed epidemic neuroses so violent as those still prevalent among rude tribes.

These and a number of similar traits separate races and peoples from each other by well marked idiosyncrasies, extending to the vast majority of their members and pregnant with power for weal or woe on their present fortunes and ultimate destinies. The patient and thorough investigations of these peculiarities is, therfore, one of the most apposite aims of modern ethnology.

In this sense we can speak of the *Volksgeist* and *Völkergedanken*, a racial mind, or the temperament of a people, with as much propriety and accuracy as we can of any of the physical traits which distinguish it from other peoples or races.

For the branch of anthropology which has for its field the investigation of these general mental traits, the Germans have proposed the name 'Characterology' (*Karacterologie*). Its aim is to examine the collective mental conditions and expressions of ethnic groups, and to point out wherein they differ from other groups and from humanity at large; also, to find through what causes these peculiarities came about, the genetic laws of their appearance, and the consequences to which they have given rise.

This branch of anthropology is that which offers a positive basis for legislation, politics and education, as applied to a given ethnic group; and it is only through its careful study and application that the best results of these can be attained, and not by the indiscriminate enforcement of general prescriptions, as has hitherto been the custom of governments.

The development of humanity as a whole has arisen from the differences of its component social parts, its races, nations, tribes. Their specific peculiarities have brought about the struggles which in the main have resulted in an advance. These peculiarities, as ascertained by objective investigation, supply the only sure foundation for legislation; not *a priori* notions of the rights of man, nor abstract theories of what should constitute a perfect state, as was the fashion with the older philosophies, and still is with the modern social reformers. The aim of the anthropologist in this practical field is to ascertain in all their details, such as religions, language, social life, notions of right and wrong, etc., wherein lie the idiosyncrasies of a given group, and frame its laws accordingly.

Perhaps what I have said sufficiently explains the aims of ethnology. Some one has pertinently called it 'the natural science of social life,' because its methods are strictly those of the natural sciences, and its material is supplied by man living in society.

The final arbiter, however, to whom it appeals, is, I repeat, not the *ethnos*, not the social group, but the individual. I think it was Goethe who, nearly a century ago, uttered the pithy remark: "Man makes genera and species; Nature makes only individuals." Hence, the justification of any result claimed by ethnology must come from the psychology of the individual; in his personal feelings and thoughts will be discovered the final and only complete explanation of the forms of sociology and the events of history. As I have elsewhere urged, man himself, the individual man, is the only final measure of his own activities, in whatever direction they are directed.*

On the other hand, the only rational psychology—using that term as a science of the mental processes—must be the outcome of anthropology conducted as a natural science. For thousands of years other plans have been pursued. The philosopher would delve in his 'inner consciousness;' the theologian would turn to his revelation; the historian would reason on his undigested facts; but the psychologist of the future, taking nothing for granted, will define the mentality of the race by analyzing each of its lines of action back to the individual feelings which gave them rise.

It is quite likely that some who have heard me thus far, and have agreed with me, are still dissatisfied. On their lips is that question which is so often put to, and which so often puzzles, the student of the sciences, *cui bono*. What practical worth have these analyses and generalizations which have been referred to?

Fortunately, the anthropologist is not puzzled. His science, like others, has its abstract side, seemingly remote from the interests of the workaday world; but it is also preëminently an applied science, one the practicality and immediate pertinence of which to daily affairs render it utilitarian in the highest degree.

Applied anthropology has for its aims to bring to bear on the improvement of the species, regarded on the one hand as groups, and on the other as individuals, the results obtained by ethnography, ethnology and psychology.

Such an improvement is broadly referred to as an increased or higher civilization; and it is the avowed aim of applied anthropology accurately to ascertain what are the criteria of civilization, what individual or social elements have in the past contributed most to it, how these can be continued and strengthened, and what new forces, if any, may be called in to hasten the progress. Certainly no aims could be more immediately practical than these.

Here again anthropology sharply opposes its methods to those of the ideologists, the dogmatists, and the deductive philosophers. It refuses to ask, What *should* improve man? but asks only, What *has* improved him in the past? and it is extremely cautious in its decision as to what 'improvement' really means. It certainly does not accept the definition which up to the present the philosophies and theologies have offered; any more than it accepts the means by which these claim that our present civilization has been brought about.

This department of anthropology is still in its infancy. We are only beginning to

* "Man himself is the only final measure of his own activities. To his own force and faculties all other tests are in the end referred. All sciences and arts, all pleasures and pursuits, are assigned their respective ranks in his interest by reference to those physical powers and mental processes which are peculiarly the property of his own species." *Anthropology as a Science*, etc., p. 3.

appreciate that, in the future, political economy, like history, will have to be rearranged on lines which this new science dictates. The lessons of the past, their meaning clearly apprehended, will be acknowledged as the sole guides for the future. It may be true, as De Tocqueville said of the United States, that a new world needs a new political science; but the only sure foundation for the new will be the old.

Applied anthropology clearly recognizes that the improvement of humanity depends primarily on the correct adjustment of the group to the individual; and, as in ethnology, its ultimate reference is not to the group, but to the individual. In the words of John Stuart Mill, the first to apply inductive science to social evolution, it is that the individual may become 'happier, nobler, wiser,' that all social systems have any value.

We may profitably recall what the same profound thinker and logician tells us have been up to the present time the prime movers in human social progress. They are: first, property and its protection; second, knowledge and the opportunity to use it; and third, coöperation, or the application of knowledge and property to the benefit of the many.

But Mill was altogether too acute an observer not to perceive that while these momenta have proved powerful stimulants to the group, they have often reacted injuriously on the individual, developing that morbid and remorseless egotism which is so prevalent in modern civilized communities. Nor should I omit to add that the remedy which he urged and believed adequate for this dangerous symptom is one which every anthropologist and every scientist will fully endorse—the general inculcation of the love of truth, scientific, verifiable truth.

It seems clear therefore that the teachings of anthropology, whether theoretical or practical, lead us back to the individual as the point of departure and also the goal. The state was made for him, not he for the state; any improvement in the group must start by the improvement of its individual members. This may seem a truism, but how constantly it is overlooked in the most modern legislation and schemes of social amelioration! How many even of such a learned audience as this have carefully considered in what respects the individual man has improved since the beginning of historic time? Is he taller, stronger, more beautiful? Are his senses more acute, his love purer, his memory more retentive, his will firmer, his reason stronger? Can you answer me these questions correctly? I doubt it much. Yet if you cannot, what right have you to say that there is any improvement at all?

To be sure, there is less physical suffering, less pain. War and famine and bitter cold are not the sleuthhounds that they once were. The dungeons and flames of brutal laws and bigoted religions have mostly passed away. Life is on the average longer, its days of sickness fewer, justice is more within reach, mercy is more bountifully dispensed, the tender eye of pity is ever unscarfed.

But under what difficulties have these results been secured? What floods of tears and blood, what long wails of woe, sound down the centuries of the past, poured forth by humanity in its desperate struggle for a better life! A struggle which was blind, unconscious of its aims, unknowing of the means by which they should be obtained, groping in darkness for the track leading it knew not whither.

Ignorant of his past, ignorant of his real needs, ignorant of himself, man has blundered and stumbled up the thorny path of progress for tens of thousands of years. Mighty states, millions of individuals, have been hurled to destruction in the perilous ascent, mistaking the way, pursuing false paths, following blind guides.

Now anthropology steps in, the new Science of Man, offering the knowledge of what he has been and is, the young but wise teacher, revealing the future by the unwavering light of the past, offering itself as man's trusty mentor and friend, ready to conduct him by sure steps upward and onward to the highest summit which his nature is capable of attaining; and who dares set a limit to that?

This is the final aim of anthropology, the lofty ambition which the student of this science deliberately sets before himself. Who will point to a worthier or a nobler one?

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*THE PROVIDENTIAL FUNCTIONS OF GOVERNMENT WITH SPECIAL REFERENCE TO NATURAL RESOURCES.**

It is with considerable hesitation that I undertake the duty which you have seen fit to impose upon me, namely, of addressing you in a representative manner on a subject of Economic Science. For I may not claim to be an expounder of its laws, although engaged in its practical application; much less do I pretend to be a representative of the science, if science it be.

This doubt alone, whether there is as yet such a thing as economic science, should unfit me for my present position before you, who have chosen this field of human inquiry as your specialty and hold it, I presume, as correlated with equal value to all the other sciences established as such.

But even conceding the right to such a correlation which I know is maintained practically by the most eminent men, I am still inclined to doubt the propriety of the title which is applied to this section of the Association for the Advancement of Science, for I conceive that the intention could not have been to single out for representation in the great concourse of sciences one portion and one method of the greater separate field of inquiry, but that the title of Economic Science was in reality supposed or intended to be inclusive of all those branches of knowledge which deal with the phenomena of political, commerical, economic and social life of mankind, and which might be comprised in the all-inclusive name of Social Science, Anthropology in Section *H*, forming its historical or descriptive part.

At least since this section *I* was formed, if not before, it has been recognized that political economy, or economics, was only a branch of a larger science, the science of the social biology of man, and that this branch could not be satisfactorily developed for any length of time without reference to and without an equal development of all other branches of the system. Hence to be abreast with the times, at least in classification and nomenclature, we should rechristen this Section to be the Section of Social Science, which to my mind would assign it its proper place in the concourse of sciences represented in the Association. Social Science would then have to determine the forces and laws and to explain the phenomena of social life, and finally, as applied social science, to direct the development of the political, economic, commercial and social intercourse of man; these four aspects of social life being all inclusive and at the same time so differentiated as to admit of their more or less separate study and largely, never entirely, independent development.

Perhaps I owe you an explanation, if not an apology, for my doubt as to whether we are *as yet* justified in classing this branch of knowledge as a science. This doubt, which I notice is shared by others, has arisen from the observation that the discussions in this field are still progressing to a very large ex-

* Address of the Vice-President, Section I, American Association for the Advancement of Science, at the Springfield Meeting, August 29, 1895.

tent on *a priori* reasoning, instead of *a posteriori*, as true science demands. The scientific method of procedure is too often neglected.

It seems that as yet both writers and practitioners rely more upon proposed working theories than upon discovered laws, and hence we find the economists divided into camps and schools, differing in the most fundamental principles; partisanship, preferences, bias of education, personal opinion, sentiment, dogmatism, rather than facts, truths, and natural laws, predicating unalterable consequences, are at the very foundation of the superstructure.

All science, to be sure, requires working theories as methods for further development, and in these there may be differences of conception which lead to diversity of opinion as to the probable truth, such as the dynamic and fluid theory of electricity, the undulatory and corpuscular theory of light. But these theories are the scaffolding outside of the unfinished building, not the foundation that is placed on broad unalterable law, on facts observed, which can be tested, and it is the organized and related condition of these facts and laws, their 'cause and effect,' interdependence, their structural aggregation which gives to the building its name and character of 'Science,' although the building may not yet be, never is to be, finished.

Do we have such a substructure and sufficient foundation walls for social science, or even for that part which has been most developed, Political and Economic Science, to deserve its appellation, or is it only a scaffolding from which to work in the erection of the building with a few isolated foundations of some of its walls, not too firmly placed and often lacking connection and mutual support?

Is not even the plan of the building so ill understood that the masons on each of the four walls have worked independently, without reference to what the whole is to be, and some of them think that they are building an independent and separate structure instead of an integral part of the whole; so that, for instance, the worker on the economic side is jealous of and quarreling with the sociologist? (*Vide* Discussion in the latest Proceedings of Am. Economic Association.)

It was not, however, my purpose to carp about names and classification, although I believe that proper nomenclature and classification assist greatly in advancing science; or to quarrel with the builders, except to warn them against dogmatism, which is unscientific, and against narrow conceptions of the sphere of their work, which is detrimental to its efficiency. I wish to emphasize that foundations are still needed on which to erect the building of social science and mutual supports for the walls, that have hitherto been left to stand independent; that the forces and stresses need to be more carefully calculated and their direction determined with more precision before the building may satisfactorily proceed. Finally, I desired to use this occasion for calling the attention of the workers on this building to the advantages they could derive for their fundamental work in this Association, which affords intercourse with the workers in other biological sciences, an advantage which the student of Social Science cannot afford to neglect.

While thus I desire to emphasize the advantages that come from such association, it will be part of my theme to point out the danger and impropriety of considering the social development of man as closely analogous to, nay, as of the same order as the biological development of plant and animal, an impropriety which is perpetrated by that school which has potently influenced economic thought for many decades, known as individualists, with Herbert Spencer as their most powerful exponont.

The revolution, which the fascinating philosophy of Darwin has brought into the manner of contemplating and explaining the life and development of plant and animal world, has with these men asserted itself in their manner of contemplating and explaining man's life. To be sure the same forces which determine the progress of development in plant and animal world are also active in the human world. We may easily agree that the same means employed in their struggle for existence, namely: selection, rejection, competition and adaptation, are also means which aid in the perpetuation, development and improvement of the human race, or its better adaptation to the conditions of existence.

So far as the simple *biologic* development of man is concerned, this may readily be conceded; and even in *social* development these forces were perhaps alone at work in the earliest history of mankind, when it just emerged from the state of mere brutishness, and are the only ones in some portions of it even now. But if we content ourselves to accept these same forces and means as the only ones now at work in shaping *social* development, we shall fail in understanding, explaining or directing that development. The two qualities by which the human individual differs from the brute, the head and the heart, the intellect and the soul, the reason and the emotions, feelings, affections—breeding the one wisdom, and the other character, the one directing, the other impelling action—have had, and will in future have still more influence upon the social development of the race. It is the existence and powerful influence of these two factors, these additional variables, in the social development, that have rendered its analysis so difficult, and that have kept our knowledge of human affairs from becoming an exact science sooner.

We do not deny the existence of the germs of these two qualities and occasional exhibition of the same in the animal, but the capacity of developing them, as far as we know, is possessed by man to such an infinitely greater degree as to approach difference in kind.

With these two qualities two new aims were added to those which man has in common with the rest of living creation, namely, to secure the development of these two qualities; but, what is more important in his social development, they lead him and enable him to interfere with the working of the natural laws of physical development, to give direction to that development without the necessity of the struggle for existence as motive, and to even influence and transform the conditions of existence, which necessitated the struggle.

These qualities develop, however, only in society to such a degree as to become the moving force of further social progress. Associated effort has bred and fed them. At first probably the same instinct that moves the ants and bees and other animals to association was alone active in man, but as these two qualities developed by application they became the directive forces both of individual and social effort, and became stronger than the mere biologic forces.

Not that thereby human development becomes a 'bewildering exception to the reign of universal law'—a kind of solitary and mysterious island in the midst of the cosmos given over to strife of forces without clue or meaning; for morals and reason also develop under laws, but the development becomes more complex, a function of more variables, a result not of physical, but psychic forces as well, and of rational deliberation.

If the progress of man in his higher social development had relied on biologic forces alone, it is not likely that he would have exceeded the stage in which we find the lowest savages, who, with all the faculties of higher man latent, and the biologic laws

almost alone active, remain on the plane of the animal.

To quote Professor Joseph Le Conte: "I have from time to time shown that there are certain limitations to the application of the doctrines and methods of biology to sociology—that in every case such limitation is the result of the introduction of some new principle characteristic of *humanity* as distinguished from *animality*, of *reason* as distinguished from *instinct*."*

And Lester F. Ward, after careful analysis, goes so far as to state rather strongly: "that the whole farrago which has so long passed for political economy is true only of irrational animals and is altogether inapplicable to rational man."†

Whatever value then all the other evolutionary, biologic forces pure and simple, have had in the *animal* development of man, in the *social* development, in the progress of moral and material civilization, the feelings, emotions or affections have played a much more important part, which has generally been greatly undervalued, until Lester F. Ward, in his Dynamic Sociology, and again in his Psychic Factors of Civilization, called forcibly attention to this fact. He recognizes these, however, only as dynamic forces, without direction, conceding to the intellect alone the power of direction. I am not prepared to deny altogether direction to the emotions, just as the force of gravity is both dynamic and directive. I am inclined to keep these two exhibits of the human mind distinctly and separably as two social forces of unequal value and direction, giving to the emotions the highest value in the past, to the intellect a more and more increasing importance, and modifying the direction of the former. At any rate we shall have to agree that the emotions have had and have the largest share in shaping men's civilization, and the recognition of this fact will appear as important with regard to the subject I have proposed to discuss.

Neither the individualists nor the socialists have recognized this notable fact which history develops at every step. The latter, *i. e.*, the *rational* socialists, in their plans of improvement of social conditions, fail to take account of it as well as of the biologic factors. They propose to hasten the millenium by making coöperation compulsory and reason rule supreme, suppressing the *individual* as in a colony of ants, each existing only as a part of the whole.

The individualists, on the other hand, desire to let our progress depend or to shape itself entirely under the working of the natural law of competition, suppressing as far as possible the *organization* which has served to develop the moral and intellectual forces, in fact they propose to reduce us as far as possible to the conditions of the brute world. They expect, to be sure, but with what right it is difficult to see, that the individuals will as such, independently of society, develop the social instinct, will desire the common good even at the expense of his own good, and finally, will seek voluntarily coöperation as a result of superior intelligence. And they claim that he will do so sooner and with less friction if let alone. It is not very clear why such a result should occur, how the free exercise of competition is to produce coöperation, which is its very antithesis. "Coöperation," as Ward states it, "always tends to reduce competition, and competition denotes want of coöperation;" and he further points out that the seeming coöperation as a result of competition is in reality only competition between corporations or classes, but in no sense the coöperation which establishes the same aims in all members of the society.

"We are told," says he, "to let things alone and to let nature take its course. But has intelligent man ever done this? Is

* Pop. Sci. Mo., Feb., 1879, p. 430.

† Psychic Factors. Ward. P. 279.

not civilization itself, with all that it has accomplished, the result of man's not letting things alone, of his not letting nature take its course?"*

In other words, the whole difference between civilization and other forms of natural progress is that it is a product of art, of artful coöperation; and this coöperation has been coerced rather than voluntary, coerced first by the few, and, as intellectual and moral forces developed, by the many.

And now we are asked to give up the advantage of this coöperation, laboriously developed, to return to the beginning as far as that is possible; and for what?—to experiment, and see whether the individual if left alone to the laws of competition would not again develop coöperation, which after all even the individualist admits with chagrin is preferable to competition.

To quote Ward again: "Competition not only involves the enormous waste, which has been described, but it prevents the maximum development, since the best that can be obtained under its influence is far inferior to that which is easily obtained by the artificial, *i. e.*, the rational and intelligent removal of that influence. Hard as it seems to be for modern philosophers to understand this, it was one of the first truths that dawned upon the human intellect. Consciously or unconsciously, it was felt from the very outset that the mission of mind was to grapple with the law of competition and, as far as possible, to resist and defeat it. The iron law of nature, as it may be appropriately called, was everywhere found to lie athwart the path of human progress; and the whole upward struggle of rational man, whether physical, social or moral, has been with this tyrant of nature—the law of competiton—and in so far as he has progressed at all beyond the purely animal stage he has done so triumphing little by little over this law and gaining somewhat the mastery in the struggle."*

The individualists who expect better success from the purely animal method have been led by the undeniable fact that, in many respects, governments have failed to perform their functions well, although even in this respect fair investigation will show that, considering the conditions and the general limitations of men, this stricture cannot be sustained to the degree that may at first glance appear to the casual observer. Now, instead of improving the methods of government, they propose to curtail the functions; instead of giving direction to the social forces—which will not be downed—they propose to neglect them, to substitute the biologic forces.

Just as the chemists, who are attempting to determine dietaries and construct universal soups by chemical synthesis, overlook the existence and claims of the palate, catering alone to the stomach, so the individualists and many economists deal with man as a machine of a given physiological construction and put in motion by physiological forces, overlooking that psychological forces are his main motive power, 'that he is to be lured, not pushed, in the way of productive effort,' or, at least, that however far for his animal development the laws of animal biology, the laws of nature, may be allowed to prevail for his truly human development, the laws of mind, and especially of heart, must and will interfere. In this development, not competition, but coöperation, is a necessity.

This rather lengthy reference to that school of sociologists whose motto is the reduction of the functions of government, who have so strongly influenced and still continue to influence, not only thought, but government activity, appears necessary, whenever we desire to discuss government functions, for whether we subscribe to the

* Psychic Factors, Ward, p. 286.

* Psychic Forces, Ward, p. 261.

views of the *laissez-faire* school, or to those of what we may call in contradistinction the *faire-marcher* school, the discussion will take a different turn.

Between the socialist and the individualist stands the true democrat, in whose creed society, the demos, stands recognized as the supreme ruler with ideals of progressive civilization as the goal of associated effort, giving all liberty possible to individual activity that does not interfere with the good of society. That good he believes to be the moral and intellectual development and material comfort of all its members, present and future, and he believes that it is attained not by negative, or merely restrictive methods, but by positive, active methods; ameliorative, or coercive, whenever the interests of society, present or future, would suffer by non-interference with individual activity or neglect. The functions of his government lie wherever coöperation of the whole will accomplish the end aimed at by society better than individual effort, avoiding interference where individual effort suffices to obtain the end of society; above all, he does not consider government as an evil and outside of himself, but as a good created by himself for the attainment of his highest human ideals, and furthermore, he always contends for the welfare of the future as well as of the present. This is the creed to which I subscribe, and until sociologic science furnishes us with the knowledge of fundamental, incontrovertible laws which with unfailing necessity produce invariable effects, we will have to state our creeds before preaching; this may not be a very scientific proceeding, but where, as I have stated, emotions play such a prominent part science and exact reasoning must suffer.

"The end of government is the good of mankind!" This briefest and broadest statement of the purpose of government, which breathes the true philosophical spirit of Locke, is much less a formula, as Huxley calls it, or a working theory, than a historical fact, expressive of the visible trend which the evolutionary development of society has taken and which the careful student of the history of mankind can now deduce much more readily than even Locke; the broadly humanitarian tendencies of the governments of to-day, as compared with those of old, stand out unmistakeably in spite of the many narrow, clannish policies that still prevail.

Yet the active politician or statesman would hardly find it practicable to formulate and direct the measures and methods for such an end on such a broad basis. He requires limitations. If he succeeds in accomplishing or promoting the good of that portion of mankind which is segregated as a nation, he may feel satisfied that he has also done his part in promoting the good of mankind.

There may then, to be sure, still remain antagonisms among the various governments which have to be smoothed away in that dim future which is the dream of the individualist, when the true 'Civitas dei,' the ideal nation comprising all mankind, is to materialize; "in which every man's moral faculty shall be such as leads him to control all those desires which run counter to the good of mankind and to cherish only those which conduce to the welfare of society." (Huxley, Nihilism.)

For the present this cosmopolitan activity appears premature even to discuss. We will do well, therefore, to hold fast to the wisdom of minding our own affairs, to regulate our own government in such a manner as to attain the good of our own nation.

However poorly at times this end of government has been attained or attempted in practice, however its functions have been perverted, however diverse the methods employed, the conception that government exists for the purpose of the good of the aggregation of mankind to which it extends,

may be asserted to have now universal acceptance among all peoples. The questions on which people differ are as to how the good of the nation is to be attained; it is as to methods, rather than objects, that diversity of opinion has always prevailed.

Even the individualist, when closely pressed and not too callous, will agree to this object of government, but he will insist that this object, the good of the nation, is attained by inactivity rather than by active exertion of the government, by allowing the individuals to work out their own salvation (or damnation) amid the free and unrestricted play of natural forces, rather than by making them do so. *Laissez-faire* instead of *Faire-Marcher!*

They overlook that the objects and the motives which inspire the action of the individual as such are and will remain entirely different from those of the aggregation of individuals. As individual he will strive and does strive to work out that 'unsocial peculiarity of desiring to have everything his own way and opposing others.' Beyond the gratification of his own desires and an interest in his immediate offspring and perhaps in the second generation, he lacks as individual, and naturally so, incentive to advance or to calculate with the future. It is only as citizen, a member of organized society, as a social being, in community with others, as a reasoner and philosopher with conceptions of the objects and aims not only of individual existence, but of society as a whole, of the race, that he allows considerations of the future to influence his action, that he realizes the higher human ideals; in this communal activity 'he feels that he becomes more a man.'

Social man, then, is not satisfied alone with the preservation of his species by means of unconscious adaptation to its surroundings, but *consciously* he adapts himself to his surroundings and, more than that, he influences and adapts the surroundings to himself, nay, he influences the future consciously, and therein, if in nothing else, he differs from the animal world and has outgrown the laws of their development.

How this has come to be so we need not inquire; it is so, that is enough. It is the momentum of education, of gradually accumulated tendencies that drives him on the path towards social and ethical improvement, with ideals in the future always before him. What we call the feeling of duty, which is the motive spring of most men's altruistic actions, is nothing but this momentum, which the accumulated education of generations has imparted to us and which produces the conscious civilizatory progress of the race, always setting up new ideals when the old ones have been attained, or when reason has dislodged them.

This civilizatory tendency has been upheld, however, only in the association, and is lost sight of by the individual as soon as he is dissociated and acts apart from his fellow members. This sounds like a paradox, that the tendencies and desires of the whole and its action should differ from the tendencies, desires and actions of its parts.

Yet even the sage of antiquity, Aristotle, recognized that, you could never arrive at the whole by a mere addition of the units composing it, that while the prosperity of the whole implied the prosperity of all individuals which it includes, yet in our treatment of social questions we must proceed from the standpoint of society, not from that of the individual, the welfare of society could not be secured by attention to individual claims. And we observe this every day in larger or smaller assemblies of men; the emotions, feelings, provoked in the assembly lead to entirely different actions than if each member separately had acted on his own motion. The feeling of patriotism, which inspires many actions of nations and is of a kind with the civilizatory tendencies referred to, can hardly be

thought of outside of organized association, and so all the altruistic and ideal aspirations of the best and most advanced apostles of humanity, which have in view the improvement of the conditions of the future, the advancement of the race, are not of an individualistic but of communist nature, possible only in society and attainable only by associated effort.

Government then, the instrument of associated action, the expedient of organized society, the brain and hand of the nation, becomes the means not only of securing social existence, but social progress, and out of this object of government arises what I have called the providential functions of government, which have in view the future of the nation, as contrasted with the current functions of government, which refer to the more immediate needs of social, political, commercial and economic intercourse.

Government becomes the representative not only of communal interests as against individual interests, but also of future interests as against those of the present. Its object is not only for the day, but includes the *perpetuity* of the well-being of society and the perpetuity of such favorable conditions as will conduce to the *continued* welfare and improvement of the same; in short, its activity must be with regard to continuity, must provide for the future, must be providential.

Mark, we do not create this special providence for the individual, but for society; the individual will have to work out his own salvation to a large extent with the opportunities for advancement offered by society, but society itself can only act through the state or government, and as the representative of the future the state cannot, like the individual, 'let the future take care of itself.'

In our present state activity and legislation there is as yet but little realization of its providential character. Even the question of education, which partakes of that character providing in part for future improvement, is only imperfectly considered from this point of view. The questions of the franchise as well as that of imigration, both of which are of greatest influence upon the future composition and condition of our society, are much more often discussed with reference to the rights of present members than with reference to the future of society.

The one condition of social life in which the action of the present influences the future almost more than in any other direction, namely, the condition of the means of material existence and their economical use (the economy of resources) has received perhaps the least recognition in practice as well as in theoretical discussion; and especially is this absence of attention to this most important branch of economics noticeable in English literature.

The reason probably is that the need of careful analysis of this factor of social life has as yet not been pressing. But as the world has been explored in all corners and the extent of its resources has become more nearly known, and as it is being rapidly peopled everywhere and the causes of depopulation are becoming less, the warnings of Malthus and Mill come home to us with new force and the study of the nature, relation to social life and development, and the economy of resources becomes a most important branch of social science, which will overshadow some of the other branches now appearing all important. When the questions of the extension of suffrage to women, of tariff, of taxation, of coinage and currency, which are all merely incidents, will have sunk into the background; the question of the economy of the resources which constitute and sustain the political, commercial and social power of the nation, long neglected, will still claim attention, for only those nations who develop their

national resources economically and avoid the waste of that which they produce can maintain their power or even secure the continuance of their separate existence. A nation may cease to exist as well by the decay of its resources as by the extinction of its patriotic spirit.

Whether we have a high tariff or no tariff, an income tax or a head tax, direct or indirect taxation, bimetalism or a single standard, national banks or state banks, are matters which concern, to be sure, the temporary convenience of the members of society, but their prejudicial adjustment is easily remediable; when ill effects become apparent, the inconveniences may be removed with but little harm to the community and none to mankind at large or to the future. But whether fertile lands are turned into deserts, forests into waste places, brooks into torrents, rivers changed from means of power and intercourse into means of destruction and desolation, these are questions which concern the material existence itself of society, and since such changes become often irreversible, the damage irremediable, and at the same time the extent of available resources becomes smaller in proportion to population, their consideration is finally much more important than those other questions of the day.

It is true that as individuals the knowledge of the near exhaustion of the anthracite coal fields does not induce any of us to deny ourselves a single scuttle of coal so as to make the coal field last for one more generation, unless this knowledge is reflected in increased price. But we can conceive that, as members of society, we may for that very purpose refuse to allow each other or the miner to waste unnecessarily. That this conception is not absurd and may be practically realized without any strain in our conceptions of government functions, is proved by the fact that it has been carried out in practice in several cases without opposition.

Absurdly enough we have begun such action with reference to our resources where it is perhaps of least consequence, as for instance, when by the establishment of hunting and fishing seasons and by other restrictions we seek to prevent the exhaustion of the fish and game resources. This is a good illustration of the fact that emotion rather than reason, sentiment rather than argument, are the prime movers of society. It was hardly fear of the exhaustion of this readily restorable resource, and economic reasons that lead to this protection of our fisheries and game, but love of sport that gave the incentive. And again it needed the love of sport, to set on foot the movement for the improvement of the roads in the United States, which the realization of true economy had not the power to bring about.

In some countries the waste of forest resources is more or less guarded against and the waste of water is at least to some extent a matter of control by society.

While we do not prevent single individuals from ruining themselves financially and hazarding the future of their families, we do prevent associated portions of the community, corporations, towns and cities, from jeopardizing their future by preventing them from extravagant expenditures and contracting of debts. This, too, is perhaps less designed for the future than to protect present members against undesirable burdens.

There are enough precedents established to show that whatever the greed and selfishness of the individual may dictate, society recognizes its right to interfere with the individual not only for its present objects, but even for considerations of the future.

To recognize how far any of the resources must become objects of national concern, it is necessary to understand their relative significance for the present and for the future development of society or of the particular nation From this point of view I

have at some former occasion classified the resources under four heads, namely:

1. Resources inexhaustible.

2. Resources exhaustible and non-restorable.

3. Resources restorable, but liable to deterioration under increased activity.

4. Resources restorable, and apt to yield increased returns to increased activity.

Of the first class, hardly any one can be mentioned that are usually denominated as resources; land, water, air and the forces of nature would fall under this class, but since it is not so much these things themselves as the conditions in which they are found that make them resources, and since these conditions are alterable by human agency, their inexhaustibility with reference to human requirements is not entirely established. With the land it is rather the fertility of the soil that makes it a resource, except so far as it serves for building purposes. With the water, except for the absolute necessity of life, it is its desirable distribution—terrestrial and atmospheric—which constitutes it a resource in the sense of satisfying human wants.

Of such resources as are in time exhaustible without the possibility of reproduction we may mention the mines. The supply of coal, 'the bread of industries,' in Europe is calculated to last not more than three or four centuries, although scarcity is expected long before that time, and in our own country we are told that anthracite coal mines do not promise more than sixty years of supply under present methods of working. The silver and gold mines, upon the basis of which Nevada became a State, are said to show signs of exhaustion. Oil fields and natural gas wells of very recent discovery belong to this class of exhaustible resources; with their consumption in satisfying our wants they are destroyed forever.

The timber of the virgin forest and its game, the water power of the streams, largely dependent on the conditions of the former, the fisheries, and to some extent the local climate conditions, are resources of the third order, capable in most instances, of reproduction or restoration under human care, after having been deteriorated by uneconomic exploitation, or by change of contingent conditions, as when brooks and rivers are lessened in volume or else filled with flood waters and debris in consequence of forest destruction.

Lastly, as resources restorable and yielding increased returns to increased activity we would find most of those resources which are the product of human labor, industry and ingenuity; the accumulated educational fund and other conditions of civilization, the people themselves, capable of performing labor.

It might appear that of the natural resources, the soil with its fertility, capable under intensive cultivation of increasing its yield, should be placed here, but when this increased activity is unaccompanied by rational methods this resource too will deteriorate almost to a degree where its restoration is practically precluded.

Altogether, while possibility of restoration has served in our classification, practicability, *i. e.*, the relation of expenditure of energy and money to the result will have to influence the ranging of the resources in these classes as far as state activity with regard to them is called for.

Often it will be a difficult task to assign a particular resource to a proper position with regard to its bearing upon social interest, but conservatism, which is the logical policy of society, will lead us in cases of doubt to lean toward the presumption that the interests of society are more likely to suffer than those of the individual; and a mistake in curtailing private interests will be more surely and easily corrected than a mistake in not having in time guarded social interests.

To properly appreciate the position in any given case, we will have to weigh the present and future significance of the resource, the likelihood of its permanence, and the likelihood of its fate under private treatment, whence the necessity of bringing it under sovereign control of the state and the quality of the control will appear.

That each individual case will require its own consideration and adjudication holds there as well as with legislation in reference to industrial action, and the general classification here attempted offers simply a suggestion as to the general points of view from which each case must be considered.

With the conception of the government before us as outlined, namely, as the instrument to secure the possibility not only of social life, but of social progress, the representative of communal interests as against private interests, of the future as against the present, we can get an idea as to how far the providential functions of the state are to be called into action.

The policy of governmental control over waterways, roads and lands, falling under the operation of eminent domain, is well established in most governments. The ownership and management of railways has proved itself as in the interests of society in several countries. It should be extended with even more reason to all exhaustible, non-restorable resources. That in the interest of society and of production as well, the mines should belong to the state in order to prevent waste, we may learn from the actual experience of France, where they are state property and only the right to work them under supervision is leased to private individuals.

Of the restorable resources it is apparent that with regard to those which yield increased returns to increased labor, the interests of society and of the individual run on parallel lines. Where interference of the state in their behalf exists, it is not from providential reasons; the amelioration functions only are called into requisition. Whatever tends to stimulate private activity is to be promoted, whatever retards development of intensive methods to be removed by government. Industrial education, cultural surveys, bureaus of information, experiment stations, and other aids to private enterprise, constitute the chief methods of expressing state interest with regard to these resources.

The three great resources upon which mankind is most dependent, and which, therefore, demand first and foremost the attention of the state are the soil as food-producer, the water and the climatic conditions. The utilization of these three prime resources by agriculture forms the foundation of all other industries, or as Sully puts it: "Tillage and pasturage are the two breasts of the state." It is true the manufacturer increases the utility of things, but the farmer multiplies commodities; he is creative, and he therefore above all others can claim a right to first consideration on the part of the state.

Whatever may be thought of the practicability of Mr. George's plans and of his conclusions, the fundamental principle upon which he bases his land theories will have to be admitted as correct. Society, the state, is the original owner of the soil. Whether the ownership should continue is another question.

The soil is a valuable resource as far as it is fertile and capable of agricultural production; the fertility, while liable to deterioration, can, with few exceptions, be said to be restorable, and it certainly yields increased returns to intelligent increased labor. It ranks, therefore, with those resources which can be left to private enterprise, calling only for the ameliorative functions of the government. But while this condition prevails, when the soil is put to

agricultural use, it does not exist as long as the soil is not so utilized. By the withdrawal of large sections of land from such use, society is harmed and deprived of the benefit which it would derive from a use of its property. The proper distribution and the appropriation of the soil to proper use form, therefore, fit functions of government control.

The rational appropriation of soil (land) to either farm use, pasturage or timber production, one would be inclined to think, could be left to the regulation of private intelligence; yet the fact is that the thin rocky soils of mountain districts are worked for a scanty agricultural crop, when they should be left to timber; while thousands of acres in fertile valleys are still under the shade of virgin forests.

Water and climate are the accessories to agricultural production and supplement the resources of the soil. Not objects of private enterprise directly, except in a limited manner, it is evident that, as far as they or the conditions which influence them can be at all controlled, they should be under the direct control of the state.

A rational management of the water capital of the world, in connection with agricultural use of the soil, will become the economic problem of the highest importance as the necessity for increased food production calls for intensive methods. And in connection with this problem, it must become a matter of state interest by a rational management of existing forests and by reforestation at the head waters of rivers and on the plains to secure the conditions which make a rational utilization of the waters possible. For without forest management, no water management is for any length of time possible, no stable basis for continued productive agriculture, industries and commerce.

I may be allowed for the sake of illustration to state more in detail the considerations which pertain to the one resource with which I am most familiar, the forest.

The virgin forest is a natural resource, which answers two purposes of civilized society. On the one hand it furnishes directly desirable material; on the other hand it forms a condition of soil cover, which influences directly or indirectly, under its own cover and at a distance, conditions of water-flow, of soil and of local climate.

To the individual it is in the first place the timber, the accumulated growth of centuries, which has an interest to him and which he exploits for the purpose of making a profit on his labor and outlay. The relation of the forest to other conditions, direct or indirect, immediate or future, hardly ever enters into his calculations. Now the exploitation of this resource is a necessity of our civilization, but the economic conditions of our country and for that of any new or partially developed country, especially the condition of the distribution of population and consequent necessity for a long haul of the bulky material, bring it about, that only the best kinds of timber and the best cuts of these can be profitably moved to market. Hence, since profit is the object, exploitation is by necessity wasteful.

Again culling the forest, which means removing the good kinds, although apparently not as destructive to the resource as clean cutting, leaves the ground to the kinds not useful or less useful to man, to the weeds of the forest. This means not only occupation of the ground by undesirable kinds, but prevention of the reproduction of desirable kinds, which being reduced in numbers, hence are at a disadvantage in the struggle for existence and especially in the struggle for the necessary light under the shade of the growth that was left.

Thus even under legitimate exploitation, such as the interests of the individual exploiter and the economic conditions of the

country predicate, the future of the resource must be injured, its value deteriorated by changing its composition and quality.

Now comes the further danger of neglect which arises from the fact that when the marketable timber is gone the interest of the individual in the forest is also gone. The conflagrations which follow the wasteful exploitation with the accumulated debris of timber operations left in the woods kill and damage not only the remaining old timber, but all the young growth of desirable kinds. An additional vegetation of weeds, tree weeds as well as others, adapt themselves to the new conditions and further prevent the reëstablishment of desirable kinds. Often these fires burn out the soil itself, which consists of the mould from the decay of litter accumulated through centuries, and thus not only the practicability but the possibility of restoration is prevented.

Thus by leaving this resource to the unrestricted activity of private individual interests it is quickly exhausted, its restoration is made difficult and sometimes impossible, its function as a material resource is destroyed.

It is possible to so exploit the forest that the natural reproduction of the best kinds in even superior quantity and quality is secured; the methods which must be employed to this end necessarily entail curtailment of present revenus, and as the new crop takes decades, nay, a century and more to grow to maturity the incentive for the short-lived individual, to curtail his present income for the sake of an income in the uncertain future is but slight. Where, as in older countries, the institution of family estates had secured stability and permanency of holdings, the interest in the future was greater and staved off the evil day of forest devastation, but even there the rapidity of change of the modern world asserts itself, and the safety of this resource in private hands has become doubtful.

The other functions of the forest, namely that which it exercises as a soilcover by preventing erosion of the soil, by regulating waterflow, changing surface drainage into subsoil drainage and thereby influencing the water-stages of rivers and its possible relation to the local climate conditions, preeminently renders it an object of government consideration.

The attempt to get the largest profit from his labor, which is the only incentive of private enterprise, is bound to lead to unconservative management, especially where the maintenance of favorable forest conditions from protective considerations is necessary, for here again the need of leaving valuable material for the time being, the need of curtailing present revenue for the sake of the future and for the sake of other people's interests can hardly be expected to be appreciated by the private individual.

Here the general principle of Roman law, *Utere tuo ne alterum noccas*, prevention of the obnoxious use of private property, establishes readily the propriety of state interference, and by *alterum* we are to understand not only the other citizen of the present, but of the future as well.

We see, then, that the forest resource is one that under the active competition of private enterprise is apt to deteriorate and in its deterioration to affect other conditions of material existence unfavorably; that the maintenance of continued supplies as well as of favorable conditions is possible only under the supervision of permanent institutions, with whom present profit is not the only motive. It calls preëminently for the exercise of the providential functions of the state to counteract the destructive tendencies of private exploitation. In some cases restriction of the latter may suffice; in others ownership by the state or some smaller part of the community, a permanent associated institution is necessary.

I close with the hope that the students of political economy associated with this Section will see that this branch of their science, the economy of natural resources, so important and yet so much neglected, requires on their part a fuller and more careful consideration.

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CURRENT NOTES ON ANTHROPOLOGY (XII.).

'CARIB ART' AND ITS SIGNIFICANCE.

WHEN Von Den Steinen went among the Carib tribes of southern Brazil he was surprised to find himself called by them a 'Carib,' until he found the word means 'a stranger' (literally 'not like us'). It is, and long has been, a term used extremely vaguely. There are tribes in Central America called Caribs, who are no more allied to the Caribbean stock than are the Iroquois. In fact, there was not a single tribe of the stock in North America anywhere at the time of the discovery.

'Carib art' has been alleged to have left its traces in Florida and in the Greater Antilles; but the curvilinear decorations, the little clay images, and the broad, rough-flaked arrow heads, asserted to be evidence of Carib work, have yet to be shown to be peculiar to that stock. In a recent pamphlet written by Mr. J. J. Quelch, curator in charge of the British Guiana Museum at Demerara, he mentions a number of such objects found on the Puruni River and the east coast, which he inclines to attribute to the Caribs, though historically they did not live in that region. Other relics were a small plate of gold, neat quartz beads, perforated, granite plates, pots and polishers and pottery with highly wrought figures of men and animals. These certainly suggest a nation to the west of the locality, but not necessarily Carib. That name should now be confined to the members of the well-marked linguistic stock which we now know so well through the admirable studies of Von Den Steinen and Lucien Adam. It is in no wise synonymous with 'Antillean,' as some have employed it.

SYPHILIS AND LEPROSY IN ANCIENT AMERICA.

As a question in the history of disease, as well as having some archæological bearings, the presence of syphilis and leprosy in America before the discovery has deservedly attracted the attention of investigators.

The latest contribution to the subject is by Dr. Albert S. Ashmead, in a series of articles in the *Journal of the American Medical Association*, reprinted in pamphlet form. He has had the good idea of studying the ancient pottery for representations of persons afflicted with these deforming diseases, and his results are quite remarkable. He finds in the mound pottery of the United States, and especially in the ceramics of Peru, numerous figures of persons with their faces or members marred by some erosive disease, akin to, if not identical with, those mentioned. His conclusions are that both prevailed in different parts of America in pre-Columbian times; but that the deformations represented are more likely to be lupoid or syphilitic than leprous, without, however, excluding the possibility of the latter.

He does not consider that the presence of these diseases on the American continent would necessarily point to an extra-American source. We know too little of their etiology to justify the construction of theories in that direction; but it enables us better to understand the significance of many of the specimens in our museums.

PREHISTORIC BOTANY.

THE American ethnologist, Charles Pickering, devoted the last fifteen years of his life to a vast work intended to show the early history and migrations of the human species by the distribution and cultivation

of plants. Though left incomplete, it is a storehouse of information and suggestion.

Since then, prehistoric science has taken a long stride, and that branch of it devoted to the study of the vegetation which surrounded primitive man and his early culture-plants has not been neglected. We have but to remember what a conspicuous feature it is in the mooted question of the origin of the Aryans to see the value attached to it by thoughtful students.

In America, Dr. Harshberger, of the University of Pennsylvania, has contributed a searching study to maize, and others have traced the archæologic history of tobacco, mandioca, etc. A work which has just appeared in Europe from the competent pen of Dr. George Buschan takes up the cultivated and useful plants found in the prehistoric sites of the old world, both Europe and Asia (Vorgeschichtliche Botanik der Cultur und Nutzpflanzen der Alten Welt, auf Grund Prähistorischer Funde, J. U. Kern, Breslau, 1895). He has prepared for it by a ten years' study of the collections in various museums and in private hands, and has received the aid of most of the eminent archæologists of Europe. His results enable the student for the first time to estimate correctly the value and meaning of much of the material collected.

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CURRENT NOTES ON PHYSIOGRAPHY (XV.).

LAKES IN THE AUSTRIAN ALPS.

An atlas of the lakes in the Austrian Alps, prepared under the direction of Professors Penck, of the University of Vienna, and Richter, of the University of Graz, begins with a folio on the Lakes of the Salzkammergut, sounded by Simony and drawn by Mullner, and lately published by Hölzel, of Vienna. The text by Mullner will constitute a number of Penck's *Geographische Abhandlungen*, to be issued shortly. A second number of the atlas will be by Richter, concerning the more eastern Alpine lakes. The eighteen maps now published are on a scale of 1: 25,000; the land tinted in two or three shades of buff, the water in several shades of blue. The land has contours, generally at 20-meter interval; the water has the original sounding and the conjectural contours for every ten meters. Numerous true scale sections are added.

In this connection mention may be made of the atlas of French lakes by A. Delebecque, published by the French Ministry of Public Works, 1892–93 (Paris, Baudry), with maps on scales of 1: 10,000 and 1: 20,000, for which a text is announced as forthcoming. The land surface is here left blank.

LOFTY BALLOONING IN GERMANY.

The scientific skill of the Germans in lofty ballooning is only exceeded by the height of their ascents. The 'Cirrus,' fitted with automatic meteorological instruments and despatched without an observer, reached heights of 16,325 m. above sea level on July 7, and 18,500 m. on September 6, 1894; the minimum recorded pressures being 85 and 59 mm., and temperatures, —53° and —67°C. It is thought that these extremely low temperatures are nevertheless not so low as they should have been; the mechanical aspiration for the thermometer being regarded as insufficient. The heights are calculated with careful regard to temperature, thus making them less than the values that would be given by rough calculation, such as has been used by certain other aëronauts.

The 'Phœnix' carried Gross and Berson to a height of 7,930 m. on May 11, 1894; but this altitude was much exceeded by the ascent of Berson alone on December 4, to 9,150 m. above sea level, where the temperature was –47.9°C. Berson prepared himself for this extraordinary flight by a good

eight-hour sleep, while his associates made the balloon and the instruments ready. He carried up a steel cylinder, filled with a thousand liters of oxygen, condensed to 200 atmospheres pressure; this to reinforce his breathing at great heights. Only once was he partly overcome with sleep; then he roused himself with a loud scolding. He made a full series of observations on the way up and down; and when nearing the ground this well-trained observer packed up his instruments, so that they should not be injured in case he alighted violently. (Dr. W. Köppen, in *Annalen der Hydrographie*, 1895, May, 179–185.)

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SCIENTIFIC NOTES AND NEWS.

THE HUXLEY MEMORIAL.

THE movement inaugurated in England, in favor of the erection of a suitable memorial to the late Professor Huxley, by Lord Kelvin, Sir John Lubbock, Professor Michael Foster and others, is taking form rapidly. In conference with Lord Kelvin, a suggestion has been made by Dr. Thurston that the monument be made international, and it is expected that, on the convening of the British committee, in October, this extension of the plan may be given formal approval and a beginning of the work affected. Every member of the original provisional committee thus far consulted is reported to be favorably disposed, and the American promoter of the plan reports from Belgium an equally favorable inclination on the part of scientific men there; and it is expected that the same disposition will be manifested in Germany and in France. Meantime, the American subscription is already headed by Mr. Carnegie with $500 (and more, possibly, if needed), and is likely to reach a large sum. It is hoped that the American committee will be made up of leading men of science in the United States and the contribution be thus made a noteworthy one in other than a purely financial way. Scientific men and others interested in this great movement may, meanwhile, transmit their pledges and subscriptions either to SCIENCE or to Dr. Thurston, and they will be promptly entered upon the list, as received. The Huxley memorial cannot fail of being made worthy of that famous man and of the great nations taking part in its erection.

THE FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE Association met at Bordeaux on August 4th, at which place its first meeting was held twenty-three years before. The members were welcomed by the Mayor of Bordeaux, who called attention to the progress made by the city in educational, scientific and philanthropic institutions since the previous meeting of the Association. The number of elementary schools has been tripled, and there have been established faculties of science, letters, law and medicine, attended by more than 2,000 students. M. Émile Trélat, the President, chose as the subject of his address, *La Salubrité*, in which he traced the more important contributions of hygiene to science and human welfare. M. Livon, Secretary of the Association, gave an account of the preceding meeting at Caen and reported a necrology and the honors which had been conferred during the year on members of the Association. The Treasurer, M. Émile Galante, gave an account of the finances of the Association, from which it appears that the receipts for the year were over 86,000 fr. The capital of the Association is now over 1,000,000 fr. A large number of grants varying in amount from 200 to 1,500 fr. were made for the advancement of science in various directions. The Association met in four sections: Mathematics, physical and chemical science, natural science and

economic science, before each of which many papers (some 200 in all) were presented.

THE RELATIONS OF PHYSIOLOGICAL AND CLINICAL RESEARCH.

One of the most interesting addresses before the *British Medical Association* was the introductory address 'On The Relationship in which Physiological and Clinical Work Stand to One Another' with which Dr. Ferrier opened the section of physiology. According to the official report in the *British Medical Journal*, Dr. Ferrier pointed out, by taking specific examples, how largely recent progress had been affected by a thorough and accurate combination of results attained by the two methods. Thus he mentioned how experimenting on animals, and from a physiological standpoint Professor Sherrington had succeeded in mapping out a whole series of skin areas in relation to segmental regions of the spinal cord. Further, from the clinical side Dr. Head had attained great success by a thorough study of herpetic areas and areas of referred pain in showing the relationship of thoracic and abdominal viscera to spinal segments. Dr. Ferrier pointed out how great were the difficulties encountered by the clinical worker, as the cases he had to unravel were so complex and at first sight contradictory; yet in so many instances, so soon as physiological work could be brought to bear upon them, order soon appeared among the mass of facts which had been accumulated. Moreover, that working under the comparatively simple conditions produced by experiment, physiologists were in a far better position to criticise and throw light upon the obscurer facts of clinical work. To many physiological problems, however, an answer could only be finally obtained as a result of clinical study, and he therefore particularly emphasized the necessity of a worker in either branch being at the same time thoroughly trained in the other.

GENERAL.

The second annual meeting of the Society for the Promotion of Engineering Education will be held in connection with the A. A. A. S. at Springfield, on September 2d, 3d and 4th. It is proposed that all papers presented before the metting shall be tributary to the subjects announced on the program. Each paper will be limited to fifteen minutes, and an abstract of about 300 words will be printed before the meeting and distributed to the members. Five minutes will be allowed to anyone wishing to discuss the papers. There will be but one session daily for the reading of papers and for discussions.

The question of an international bibliography of science appears to be receiving attention in all directions. An international bibliographical conference has been called to meet in Brussels, September 2–4, of this year. The programme includes the discussion of the following propositions: 1. The foundation of an international institute of bibliography. 2. The adoption of an international and universal classification of bibliography. 3. The publication of a universal bibliographical *Répertoire* by an international bureau which shall seek the cooperation of all existing bibliographical agencies. 4. Proposal to various governments to establish an international bibliographical union.

The *Berliner Akademie der Wissenschaften* has elected as corresponding members Prof. Wilhelm V. Gümbel (Münich), Prof. Albrecht v. Zittell (Münich), Prof. Albrecht Schrauf (Vienna), Prof. Alfonso Cossa (Turin), Prof. Alexander Agassiz (Cambridge), and Prof. Eleuthère Mascart (Paris).

Professor Bonnet, professor of anatomy in the University of Giessen, has received

a call to Greifswald, and Dr. M. Miyoshi has been appointed professor of botany in the University of Tokyo.

THE Paris Academy has elected Prof. Retsius and Dr. Bergh, of Copenhagen, as correspondents.

ACCORDING to the *British Medical Journal*, in the discussion on the revision of the *British Pharmacopœia*, at the annual meeting of the British Medical Association, Dr. Donald MacAlister announced on behalf of the editing committee that the metric system would be introduced into the forthcoming edition. To facilitate transition in the pharmacopœial article the official proportions will be given in the familiar British measures as well as metrically. In all gravimetric and analytical operations, however, the metric system alone will be made authoritative.

MR. W. NELSON GREENWOOD, of Glasson Dock, Lancaster, Eng., has addressed a circular letter to the shipmasters throughout Great Britain asking their opinions regarding the advisability of making a change in time reckoning. Mr. Greenwood, who publishes Tide-tables and a Nautical Almanac for the use of English seamen, is himself favorable to the unification of the civil, nautical and astronomical days.

THE papers by Mr. Borchgrevink before the *International Geographical Congress* attracted special interest. The Norwegian explorer described his voyage on the steam-whaler Antarctic during which he and his companions landed on Cape Adair, being the first to land on the Antarctic continent, which may be twice the size of Europe but of which we at present know nothing. The Congress unanimously passed the following resolution:

"The sixth Geographical Congress, assembled at London, 1895, with reference to the exploration of the Antarctic regions, expresses the opinion that this is the greatest piece of geographical exploration to be undertaken, and, in view of the additions to knowledge in almost every branch of science which would result from such scientific exploration, the congress recommends that the several scientific societies throughout the world should urge, in whatever way seems to them most effective, that this work should be undertaken before the close of this century."

MR. BINNIE, the engineer of the London County Council, has proposed a plan for a new water supply for London. It is proposed to bring the water from the valley of the Wye in two covered aqueducts, the largest in the world, the one 150, the other 176 miles in length. Each is to convey 200,000,000 gallons of water per day.

FOLLOWING the horseless carriage contest in France, one between Chicago and Milwaukee is proposed for which prizes amounting to $5,000 are offered.

IT is stated that astromonical observations on Mont Blanc will begin soon. The Polar 'siderostat," superseding the ordinary telescope, has reached Chamonix.

THE section of anatomy and histology at the recent meeting of the *British Medical Association* was of special interest, as it was the first time that a section for anatomy had been made at the meetings of the Association.

THE Indian Survey Department has sent out a scientific mission with the object of establishing a longitudinal rectification between India and Greenwich.

JOHN WILEY & SONS have published the first thousand of the fifth edition of Professor Mansfield Merriman's 'Treatise on Hydraulics,' which has been revised and enlarged by 43 pages, and a full alphabetical index has been added.

THE *American Antiquarian* states that M. Suares has given £40,000 to the French Archeological School at Cairo.

AT the recent meeting of the *International Geographical Congress* papers were

read by Professor Brückner and Mr. Frank Campbell on Geographical Bibliography, and a resolution was unanimously passed recommending that the permanent bureau should follow out the subject of geographical bibliography,and authorizing the bureau to associate with itself competent persons and give them the necessary power for prosecuting the inquiry.

Dr. P. Mansen presented a paper before the *British Medical Association* on the malaria parasite, dealing more especially with the life history of the parasite outside the human body. He showed from experiments made at his suggestion by Surgeon-Major Ross that it is probable that the intermediate host is the mosquito.

The apparatus used at the Pasteur Institute for the discovery and treatment of bacteria and bacilli will be exhibited at the Atlanta Exposition.

By act of the Legislature of the State of Ohio a clay-workers' school has been established at the Ohio State University, where the chemistry, mechanism and manual work of everything connected with clay industries is taught. Prof. Orton is the director of this school.

At a recent meeting of the Board of Scientific Directors of the New York Botanic Garden it was resolved to authorize a topographical survey of the 250 acres of land in Bronx Park which have been set aside for the uses of the garden. All the trees in the park are to be labelled, and new varieties of seeds desirable for cultivation are to be secured.

Mr. Marshall M. Tidd, a well known civil engineer, died in Woburn on August 20th, at the age of sixty-eight. Mr. Tidd was one of the oldest members of the Boston Society and the American Society of Civil Engineers.

The Commissioner of Patents, John S. Seymour, has submitted to the Secretary of the Interior a summary of his report for the year ending June 30th, 1895. 20,745 patents were granted during the year.

Col. Henry L. Abbot, of the Engineer Corps, has been placed on the retired list of the army.

The Russian National Health Society announces that it will celebrate, in May, 1896, the one hundredth anniversary of Jenner's first experiments in vaccination. To commemorate the event the Society proposes: (1) to offer four prizes for the best works upon vaccination; (2) to collect and publish materials for a history of the practice of vaccination in Russia, and also a short history of the same in western Europe; (3) to publish a Russian translation of Jenner's works, with his biography and portrait; (4) to organize an exhibition of objects connected with vaccination; and (5) to hold a commemorative meeting on the day of the centenary.

The French Société de Médicine Publique et d'Hygiène Professionnelle offers, according to the *Medical Record*, three prizes for the best *mémoire* on 'Preventable Diseases and the Preventive Measures to be Taken.' The first prize is 1200 fr., the second 800 fr. and the third 500 fr. The essay is not to exceed from twenty to thirty pages of 500 words each. The following points must be treated: How to prevent contagious diseases during the illness and after; private sanitation of patients and those who tend and treat them; house sanitation and disinfection, and general sanitation during illness.

One of the most interesting features of the meeting of the *British Medical Association* in the collection of medical antiquities found in Italy by Dr. Luigi Sambon and exhibited by Messrs. Oppenheimer at the Savoy Hotel. It consists of a number of surgical instruments and terra cotta models collected from ancient Roman and Etruscan

temples and tombs. The models are votive offerings (donaria) which used to be presented to the shrine of some deity by the common people, and their medical significance is Dr. Sambon's own discovery. Looking one day at the collection of these objects in the museum at Rome, he noticed that they were intended to represent portions of the human body, certain internal organs, and so forth, a fact which had completely escaped the eye of the lay antiquarian, who took them to represent fruits. This discovery aroused Dr. Sambon's interest, and he began to collect specimens from various places in Italy. He has now got together several hundreds, chiefly from the Temple of Maternity at Capua, the Temple of Minerva Medica in Rome, and from the Etruscan towns of Corneto, Civita Lavinia and Veii. These terra cotta figures were in some cases thankofferings, in others appeals for children, for relief from some disease or deformity, and so on. The model represents the part of the body affected—the face or part of the face, the ear, a limb, or some internal organ—and, though rough, they are fashioned with a considerable knowledge of anatomy.—*London Times.*

CORRESPONDENCE.

CONSCIOUSNESS AND EVOLUTION.

PROFESSOR BALDWIN'S article on 'Consciousness and Evolution' in the last number of this journal should be carefully read and considered. No student of evolution can ignore consciousness and its place in organic development, but clear ideas can only be obtained by serious psychological study. Thus Darwin in discussing 'sexual selection' continually passes from those secondary sexual characters which are useful to the male in conquering other males or in finding and securing the female, to those characters which are supposed to please or charm the female. He does not realize the great difference in the two problems. The former is simply a special case of 'natural selection.' The latter introduces entirely new factors. The taste in the female which prefers certain colors in the male is no less complex than the colors preferred. So long as it is not possible to assign any useful function to the female taste, nothing whatever is gained by assuming it to be the cause of the preservation of otherwise harmful characters in the male.*

Now as I understand Darwin in this instance and Professor Cope in those of his writings that I have read, consciousness *qua* consciousness, in interaction with the physical world, is used to explain the preservation (Darwin) and even the origin (Cope) of variations. Thus Mr. Cope remarks (SCIENCE N. S., Vol. II., p. 125):

"The cause of the movements of organic beings are various. The best known are conscious states, as hunger, cold, heat and various other sensations; some of them of higher mental grade, as fear, anger, etc. Movements by the lowest animals, as that drop of jelly, the amœba, appear to be the result of sensations. * * * * * The phenomenon of heliotropism, for instance, when these simple creatures leave the dark and crowd into light places, cannot be shown to be due to chemical or physical causes only. They seek oxygen, which is more abundant where sunlight penetrates, but they have to be aware that they need it, and must have some knowledge of the fact when they get it."

Probably most psychologists would say that the causes of the movements of organic beings are physical stimuli acting on a complex physical organism. If we can never explain the movements of protozoa toward the light by chemical or physical causes, then it must be by some form of energy analogous to these. When Mr. Baldwin writes, "I agree with Mr. Cope that most race habits are due to conscious function in the first place," he probably means that the habits are due to the cerebral concomitants of consciousness, but I understand that Mr. Cope would assume consciousness in causal interaction with the physical world.

Mr. Baldwin does well to call attention to the relation of the social environment to human ev-

*I should myself take it for granted that the female likes certain traits because they are present in the male, not that the traits are present in the male because the female likes them. I venture to suggest that the bright colors and useless appendages in the male develop an accompanying alertness that more than counterbalances their drawbacks.

olution. The survival of the fittest, in the case of man, is as much a survival of fit ideas, institutions, etc., as of individuals. In man individual plasticity is required rather than inherited special traits. A realization of this would make a book such as Mr. Kidd's *Social Evolution* impossible. Mr. Kidd's major premise is that evolution takes place exclusively through severe natural selection, but, as a matter of fact, human progress also occurs through coöperative improvement in the social environment.

Professor Le Conte has contributed a very interesting address to the July number of *The Monist* in which he distinguishes social progress from organic development. He, however, regards the Lamarckian factors as essential to human progress, and does not, I think, adequately value the progress that can be made through improving the environment without regard to any organic change in the individual. Indeed I shall follow the advice of Mr. Le Conte in a recent number (Vol. I., page 188) of this journal and venture to point out what seems to me a fallacy in his argument. Mr. Le Conte writes: "Now I cannot at all accept this view [that Lamarckian factors are no factors in evolution]; I will not stop to argue it, but simply point out some logical consequences when applied to human progress; consequences which, it seems to me, are nothing less than a *reductio ad absurdum* for the view;" and he proceeds to describe the consequences, "the pitiless destruction of the weak, the sick and the helpless," against which "we instinctively revolt." But even if these practical consequences follow, one is surely not justified in arguing that facts do not exist because we would gladly have them otherwise.

J. McKeen Cattell.

SCIENTIFIC LITERATURE.

A Text-book of Zoögeography. By Frank E. Beddard. Cambridge, 1895. (Cambridge Natural Science Manuals—biological series.)

Zoögeography treats of the geographical distribution of all animals, and in 'A Text-book of Zoögeography,' Mr. Beddard himself says: "The science is not limited to a consideration of the animals which inhabit dry land; but," he immediately adds, "this volume will only deal with *those forms*, touching incidentally upon some of the fresh water species, whose distribution is apparently governed by the same laws as those which govern the distribution of the purely terrestrial animals" (p. 4). Inasmuch as the distribution of marine animals is determined by other factors than the distribution of terrestrial and fresh-water forms, we have some reason to complain of the too comprehensive scope of the title, but, with this caveat, we can judge the work in question on its own merits as an epitome of the geographical distribution of mammals and birds with some references to other animals.

The time-honored Sclaterian 'regions' are retained, although modified by their own author long ago (1876). The subject-matter has been repeatedly discussed and need not detain us here. The reasons (often traversed) which have influenced Mr. Beddard are given by him at length (pp. 85–87). It is not untimely, however, to repeat that there is an entire want of congruity between the inland and marine faunal realms, and it may be added that while there is every gradation between marine and fresh-water types, the great bulk of fresh-water fishes, at least, has long been segregated completely from salt-water types, the Ostariophysi, including the hosts of Characinids, Cyprinids, Gymnotids, Silurids and their numerous allies, having only a few descendants that have reverted to the salt waters. This great assemblage, by the way, furnishes an excellent illustration of the truth of Mr. Beddard's assertion that "the facts of distribution are constantly liable to be misunderstood through ignorance of classification," and that "a knowledge of comparative anatomy is absolutely essential to the student of distribution" (25). The several families of Ostariophysi are widely separated in European works on ichthyology and associated with forms with which they have no affinity. Such knowledge, too, would have prevented the coupling of the *Galaxiidæ* and *Haplochitonidæ* as 'two families of Salmonoid fishes' (171), for they really have no relationship to the Salmonoids, but represent a group confined to the fresh waters of the southern hemisphere. Another misapprehension as to relationships on account of superficial similarity disguising anatomical differences is responsible for the statement that "the chief feature of the island [Madagascar] is the pres-

ence of the American genera *Philodryas* and *Heterodon* among snakes, a fact which is remarkably paralleled by the *Centetidæ* among the Insectivora" (189). The Madagascar snakes are differentiated generically and belong to different groups from the American species, and the Centetidæ belong even to a family differing from the American forms (Solenodontidæ) with which they have been associated.

Mr. Beddard's work is very suggestive and leads to so many questions of interest that it is with difficulty we can circumscribe our inquiries within the limits of a review. We can only touch upon a few points of interest.

Although the only class groups systematically considered by Mr. Beddard are the mammals and birds, he has introduced a number of sections treating of the distribution of various minor groups, as the edentates, cuckoos, tortoises, lizards, crocodiles, snakes, batrachians, scorpions and earthworms. The section on the earthworms is especially valuable, as it contains the results of Mr. Beddard's most recent investigation of a group of which he has made a special study and quite lately published a monograph.

Mr. Beddard very properly remarks that "Land Mollusca would appear on many grounds to be exceedingly valuable as furnishing evidence in favour of ancient land connections" (p. 83), but then quotes Mr. Blanford in opposition. Recent molacologists, and above all Prof. Pilsbry, have done much to correlate the data of structure and distribution. We feel inclined here to take exception to the statement re-echoing the old idea of 'the existing genera *Pupa* and *Zonites* going back to carboniferous times' (p. 85). The carboniferous species referred to those genera are certainly much like the recent species, but it must be remembered that shells having the same contours are secreted by animals quite dissimilar in anatomical features. The presumption is entirely against the generic identity of the ancient and modern forms, and *Dendropupa* (Owen, 1862) is a name proposed for the old upiform shells. Nevertheless the groups of mollusks are very long lived, and their presence in a country has a significance quite different from that of a mammal or other vertebrate. This may be well understood when we recall that almost all of the modern families of mollusks originated before the commencement of the tertiary period, while almost none of the families of mammals came into existence until long after. The correlated fact follows that few families or even genera of mollusks are circumscribed in their distribution like so many of the vertebrates.

Mr. Beddard, in his systematic sketches of the various regions of the globe, has added lists of 'families' and 'genera' supposed to be 'peculiar to' those regions, but sometimes without sufficient reason. For example, of 'genera confined to the [Palearctic] region' (p. 89), *Anurosorex* also occurs in the oriental region (Assam), *Bos*, however restricted, in the oriental region at least; *Capra* in 'the Neilgherries and some other ranges of southern India' (p. 22), and *Perisoreus*, *Cyanocitta*, *Nucifraga* and *Acanthis* are common in North America. Indeed *Cyanocitta* is exclusively North American, and must have been introduced into the present list through some mistake. The lists of the families and genera peculiar to the 'Neoarctic region,' as well as to the 'Neotropical region,' require still more revision and large additions which space forbids us to undertake. In view of the fact that many peculiar South American genera have been omitted, we are rather surprised to find Tomes' almost forgotten *Hyracodon* (1863) resuscitated as a 'peculiar' genus of Neotropical marsupials (108). Tomes' genus may possibly have been based on a young *Didelphys*, although the characters assigned scarcely seem to be applicable to such; it has even been overlooked by Thomas, but in any even the name *Hyracodon* cannot be used, as it had been taken previously by Leidy for a well-known extinct genus related to the rhinoceroses.

Because animals are found between certain degrees of latitude, it does not follow that they specially affect the temperatures prevalent in the lowlands of such countries. The humming birds may be more numerous in tropical lands, but many types are confined to mountains and occur about the summits of very high ones and consequently in cold regions. Mr. Beddard says that "it upsets the current notions as to the tropical habits of the humming birds to learn that a species, *Selasphorus rufus*, breeds in Alaska" (p. 97), but the well-known facts as to the elevations where humming birds occur and as to the extension of species into the still

bleaker regions of the southern hemisphere should 'upset' any notion as to their intolerance of cold. Nor is it necessary to postulate a decreased temperature as the cause of isolation of the relics of a past dynasty. The proposition that the tapirs are 'purely tropical animals,' and that they have been isolated 'by the gradual decrease of heat in the northern hemisphere' (p. 131), is scarcely tenable in view of the fact that one of the species—*Tapirus pinchaque*—is an inhabitant of heights where the temperature is but moderate. The camelids, whose now living members are as isolated as the tapirs, are likewise capable of withstanding much cold as well as heat. Their demission from regions once inhabited by an ancestral stock must therefore have resulted from other complications than loss of heat, although that may have been one of the causes. Temperature in many cases affects animals indirectly (by means of its influence on the food supply) rather than directly.

Numerous names are used for animals for which those who follow strictly rules of priority would employ others, and probably Mr. Beddard himself would in some cases use others if he reconsidered the questions involved. Among such is *Platydactylus facetanus*, properly known as *Tarentola mauritanica*, which we refer to in order to add that it certainly cannot be called a 'cosmopolitan Gecko' (p. 10), inasmuch as it is almost or (according to Boulenger) quite limited to the 'Mediterranean District.' In one case at least different names have been used for the same genus, as *Semnopithecus* (106) and *Presbytes* (103). In other cases wrong names have been used instead of those intended, as *Cricetomys* (90) for *Cricetus* and *Chœropotamus* (100) in place of *Chœrodes* (preoccupied) or *Chœropsis*, and these might perplex some readers, as there are genera legitimately bearing the names so misused. Another error is manifest in the statement that the Central American tapirs 'were separated by the late Mr. Alston as a distinct genus *Elasmognathus*' (p. 109), that differentiation having been effected by Gill and Alston did not approve of it.

Typographical errors occur to (or possibly slightly above) the normal extent we are accustomed to find in works in which so many names of Greek or Latin origin are used. The following have been found in a hasty perusal, and are here noted for the benefit of readers: *Charadriæ* (8) for *Charadriidæ*, *Chærocampa* (10) for *Chœrocampa*, *Jemlanica* (21) for *Jemlaica*, *Cinisternidæ* (38) for *Cinosternidæ*, *Testudinæ* (39) for *Testudinidæ*, *Pixys* (39) for *Pyxis*, *Pelomedusæ* (39) for *Pelomedusidæ*, *Chelydidæ* (39, 40) for *Chelyidæ*, *Carettochelydidæ* (39) for *Carettochelyidæ*, *Geckotidæ* (40) for *Geckonidæ*, *Xanthusiidæ* (42) for *Xantusiidæ*, *Loxocenius* (46) for *Loxocemus*, *Discophidæ* (49) for *'Dyscophidæ*, *Casarca* (46) for *Casarea*, *Panthalops* (89, 92) for *Pantholops*, *Ipeyan* (89) for *Impeyan*, *Autrozous* (93) for *Antrozous*, *Ovibus* (93) for *Ovibos*, *Pilohela* (94) for *Philohela*, *Cærebidæ* (107) for *Cœrebidæ*, *Rhymphastidæ* (107) for *Rhamphastidæ*, *Mimocychla* (108) for *Mimocichla*, *Apterygiidæ* (113) for *Apterygidæ*, *Starnænas* (108) for *Starnœnas*, *Calænas* (114) for *Calœnas*, *Hoplochitonidæ* (171) for *Haplochitonidæ*, *Paretroplopus* (178) for *Paretroplus*, *agestis* (186) for *agrestis*, *Mani* (204) for *Maui*, and *Dicœidæ* (204) for *Dicæidæ*.

Some others of new orthography perhaps have been given as corrections, as *Osteolæmus* (43, 44) for *Osteolœmus*, although a number that would much more bear correction are allowed to retain their original form, such as *Pediocœtes* (97) for *Pediœcetes*, and *Lymnæa* (142) for *Limnæa*. *Osteolæmus* indeed is perfectly in accord with classical words, as, *g. e.* ὀστεογενές (Aristotle), and a word frequently used by Mr. Beddard himself—osteology.

We would not be deemed to have examined the work thus criticized with a censorious mind; recent inquiries into the margin of error in various publications have led us to apply the same method to Mr. Beddard's volume, and we have been incited by a spirit of curiosity rather than of fault-finding. 'Balm' for the errors he and his printers have fallen into may be found in like failings of others (see SCIENCE for July 26, 1895). Really Mr. Beddard's work is a meritorious production and contains much that would be looked for in vain in larger works; it will, indeed, be of more use to some than a more bulky production, and we wish for it all success. If a second edition is called for, the corrections here made may help the author to perfect it.

THEO. GILL.

Lehrbuch der allgemeinen Psychologie. Von DR. JOHANNES REHMKE, a. ö. Professor der Philosophie zu Greifswald. Hamburg and Leipzig, Verlag von Leopold Voss. 1894. Pp. 582.

The plan of this work is quite different from that of the many other treatises on psychology which are now issuing from the press. The emphasis of its author, Professor Rehmke of Griefswald, is placed throughout on the determination of the general questions which underlie psychological science rather than on the detailed investigation of psychological phenomena; and he offers his results as a guide for the cultivated reader as well as for technical students. This plan inevitably leads to the inclusion in the one volume of two subjects, the science of psychology and the philosophy of psychology, which most writers nowadays endeavor to keep separate. As a result the treatise divides into three parts, of which the first, *Das Seelenwesen*, is clearly metaphysical; the second, *Der Seelenaugenblick* (the psychology of the static moment), and the third, *Das Seelenleben*, combine scientific and philosophical investigations in a not altogether unambiguous way.

In philosophy Professor Rehmke belongs to the sharply defined group of German thinkers known as 'monists of consciousness.' In his criticism of the various views of the mind, therefore, he is very severe on all materialistic views, 'old' and 'new,' on all positivistic tendencies, and on 'neo-Spinozism,' while the current theories of the 'spiritualists' themselves find sharp treatment at his hands. His own doctrine is based on his belief in consciousness as the ultimate reality and insists, for its empirical foundation, on the presence in all consciousness, even the least developed, of the *Bewustseins subject*, as an essential 'moment.' If this mean, 'self-consciousness,' as it seems most nearly to do, it is to be feared that Dr. Rehmke's fundamental position is vitiated by the now widely accepted conclusion that the consciousness of self or 'subject' is not present in the beginning of conscious life but comes after a period of growth. The general position, on the other hand, brings him into agreement with most psychologists of the day in regard to the question of 'unconscious' psychical states. These are vehemently rejected, and any theory which shows the faintest tendency toward a belief in them is condemned out of hand.

In the more scientific portions of the work the same combination of individuality and agreement with received conclusions constantly manifests itself. The 'elementary sensations' of the associationists and evolutionists are denied, and in general all 'synthetic' theories of consciousness. Indefinite, undifferentiated consciousness of space is made a factor in cognition from the start, and even in developed space-perception the functions of movement and muscular consciousness are minimized in favor of vision. Feelings are reduced to simple pleasure and pain, which, however, are as rememberable as perceptions themselves; while the burning questions of the day in regard to the nature of emotions seem entirely unconsidered. As against Brentano and Münsterberg the actuality of will is strenuously maintained, but in the restricted sense of 'causal consciousness,' which is further interpreted as belonging to the 'Seelenaugenblick' and so independent of all concrete action, present or represented.

As a whole, therefore, Professor Rehmke's *Lehrbuch* is interesting but not satisfactory. Unquestionably psychology to-day, even psychology as science, is suffering from the lack of settled fundamental ideas and principles. But it is very questionable whether these can best be discussed in so close conjunction with the attempted explanation of the phenomena of concrete psychical life. And the endeavor to give a complete consideration of both in a single volume is, as things are now, hopeless from the start.

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Paleontology of Missouri. By CHARLES R. KEYES, State Geologist. Missouri Geological Survey, Vols. iv. and v., 314 and 320 pages, 56 plates and a geological map of the State. Jefferson City. 1895.

This review of the fossils of Missouri is a radical departure from the reports which are usually made on the subject of paleontology. It is an attempt to make this subject as economic as possible in its bearing. Instead of giving new names to an endless number of forms, accompanied by long technical descriptions, it has

been the aim to avoid them so far as possible. The 'new species' described are scarcely more than a dozen in number. Particular attention is called to the economic value of fossils, a fact which is so commonly overlooked. A successful attempt has been made to present the ancient organisms in their proper light, and it is quite manifest that the emphasis placed on this side of the question has been none too great. In reality the fossils are regarded as labels to the rocks containing them, telling the observer at a glance the age of the beds being worked and providing a most reliable guide in directing the miner and prospector to the layers most likely to contain the minerals sought.

It is stated that the report is the outcome of a widespread desire which has existed for many years among the more enlightened class of citizens who are interested directly in advancing the mineral development of the State. The demand for accurate accounts of the organic remains found in the rocks of the region is shown to have become more and more urgent in the light of the fact that the fossils have such a distinct practical importance. In the attempt to satisfy properly the calls arising in connection with the work, it has been the aim of the author to present as briefly as possible: (1) an index to the fossils of the State, through means of which forms now known to occur within the limits of the region considered may be recognized rapidly without recourse to great libraries; (2) a list of works pertaining to Missouri fossils, in which has been brought together all that has been written on the subject and that is now widely scattered and almost inaccessible; (3) a concise summary of all that has been done up to the present time in this branch of science, so far as it pertains to the State; (4) knowledge to more comprehensive study involving the solution of problems now more or less obscure concerning the arrangement and relations of the various strata. In short, it is a handbook of the fossils of the State adapted to the use of the teacher, student and layman alike.

The general plan of treatment of the different species enumerated has been to give under each a more or less complete bibliography, by reference to which additional information or good illustrations of the forms not here figured may be found. In the diagnoses the author has endeavored to give a rather full description of some leading representative of each genus, accompanied by a suitable figure, and to make the sketches of the other members of the genus brief and in a great measure comparative. In this way of dealing with the subject it is thought that the characterizations of all the species will be sufficiently ample for intelligent comprehension and for the particular uses to which the work will be put. At the same time the bulk of the report is greatly reduced—to one-fourth at least of what it otherwise would have been. The matter of localization is necessarily rather general, allusion being made to the nearest post office usually, or in a few instances, when the fossil is common and the distribution wide, merely to the county. As a further help there has been appended a stratigraphical catalogue, which is intended for ready reference, and a synonymic index list of all the names applied to Missouri species.

The chief characteristics of this report, as enumerated above, show that in many particulars it is radically different from the usual reports on paleontology prepared by the various State Geological Surveys. That it will be of much practical value to the citizens of Missouri is certain. On the other hand, the report gives a sufficiently complete scientific account of what is at present known concerning the fossil organisms of the State, and opens the way for future work of a more detailed and exhaustive nature.

U. S. Grant.

Geol. and Nat. Hist. Surv. of Minn.

NEW BOOKS.

A Hand-book for Surveyors. Mansfield Merriman and John P. Brooks. New York, John Wiley & Sons. 1895. Pp. 196.

Die Vertheilung der Erdmagnetischenkraft in Österreich-Ungarn. Von J. Litzner. 1st Part. Wien. 1895. Pp. 232.

Annual Report of the Pennsylvania State College for 1894. Clarence M. Busch, State Printer. 1895. Pp. 375.

A Working Manual of American History. William H. Mace. Syracuse, N. Y., C. W. Bardeen. 1895. Pp. 297.